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**Patentanmeldung Nr. Patent application No. Demande de brevet n°**

03010490.5

**PRIORITY  
DOCUMENT**  
SUBMITTED OR TRANSMITTED IN  
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Der Präsident des Europäischen Patentamts;  
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For the President of the European Patent Office

Le Président de l'Office européen des brevets  
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**R C van Dijk**



Anmeldung Nr:  
Application no.: 03010490.5  
Demande no:

Anmeldetag:  
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Anmelder/Applicant(s)/Demandeur(s):

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ALLEMAGNE

Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:  
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.  
If no title is shown please refer to the description.  
Si aucun titre n'est indiqué se référer à la description.)

Method for speech communication

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**09. Mai 2003**

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**„Method for Speech Communication“**

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## **Method for speech communication**

The invention is directed to a method for speech communication, in particular, in a vehicular cabin.

It is the problem underlying the invention to provide a method improving the speech communication in a vehicle. This problem is solved by the method according to claim 1. Accordingly, a method is provided comprising

receiving input signals emanating from at least two microphone arrays each comprising at least one microphone,

processing the input signals of each microphone array, wherein a temporal and a spatial distribution of the input signals of each microphone array is determined to control an attenuation of the input signals.

According to a preferred embodiment, the step of processing the input signals comprises processing the input signals of each microphone array by a beamformer.

Further features and embodiments of the invention are explained in the following with reference to the figures.

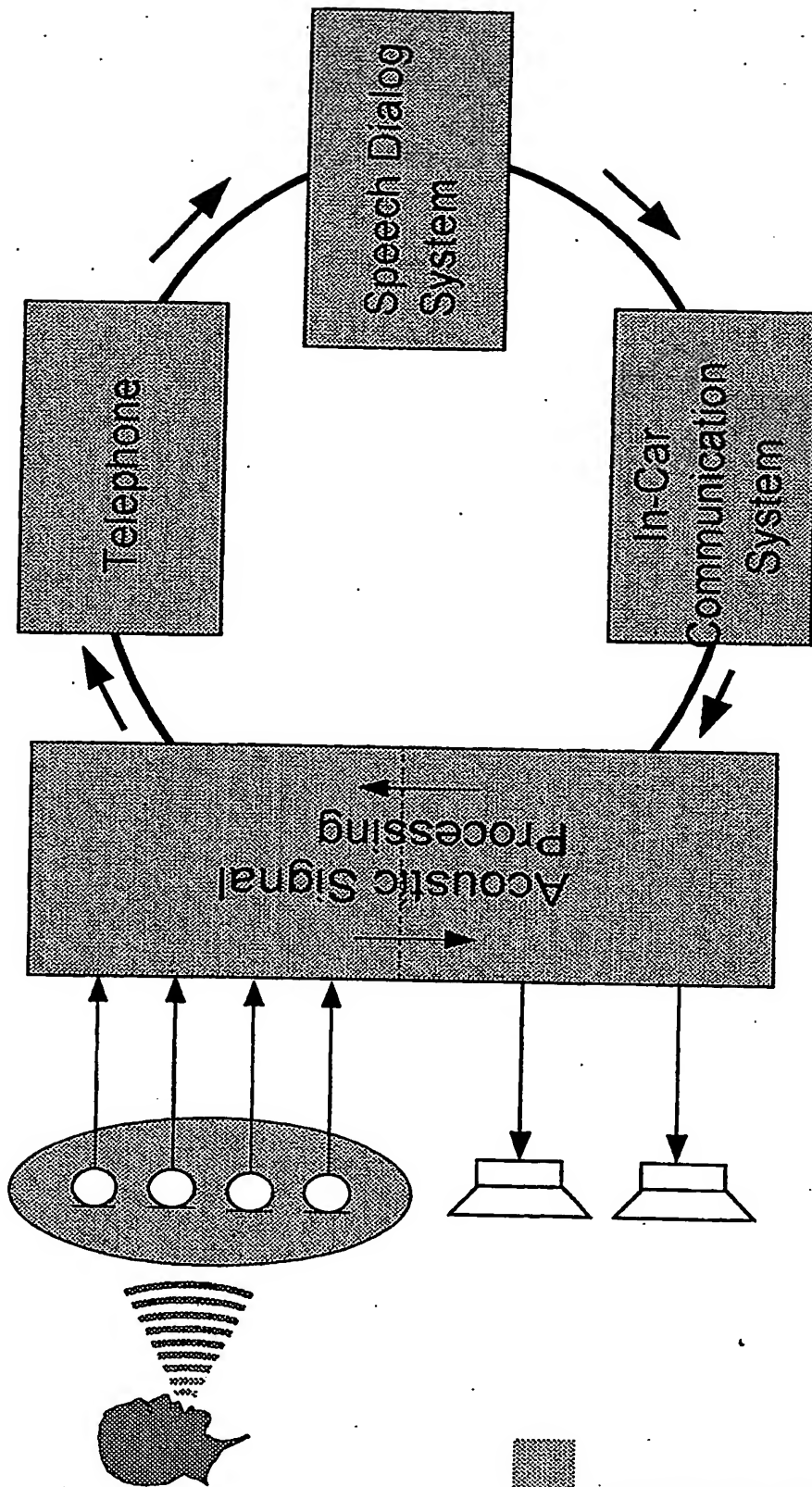
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## Claims

1. Method comprising:  
  
receiving input signals emanating from at least two microphone arrays each comprising at least one microphone,  
  
processing the input signals of each microphone array, wherein a temporal and a spatial distribution of the input signals of each microphone array is determined to control an attenuation of the input signals.
2. Method according to claim 1, wherein processing the input signals comprises processing the input signals of each microphone array by a beamformer.

## System Overview

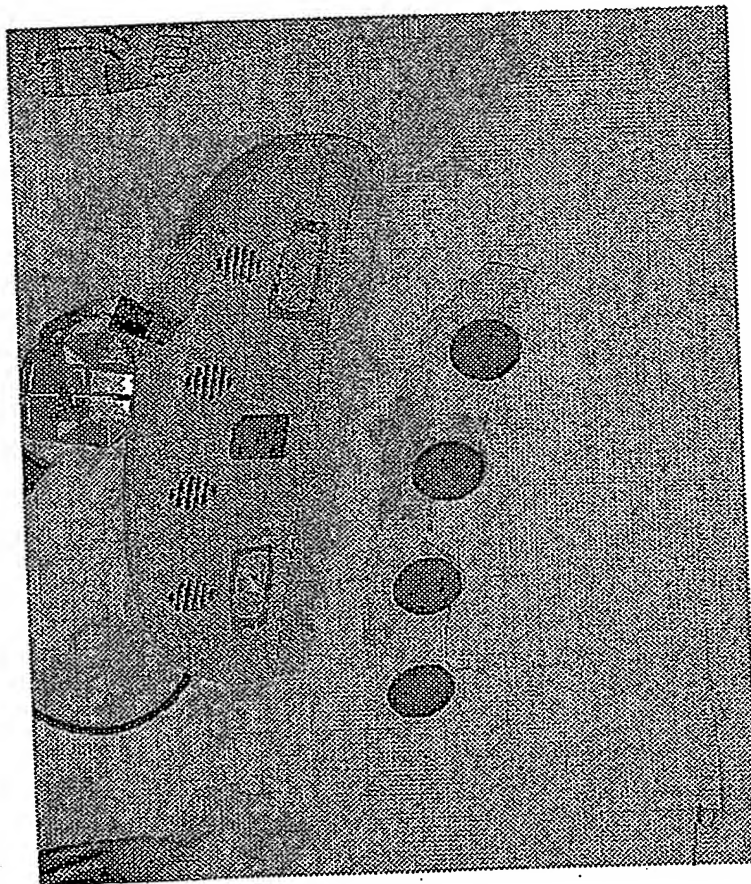
Integrated hands-free communication system



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## Microphone Array

4 microphone array integrated in interior mirror



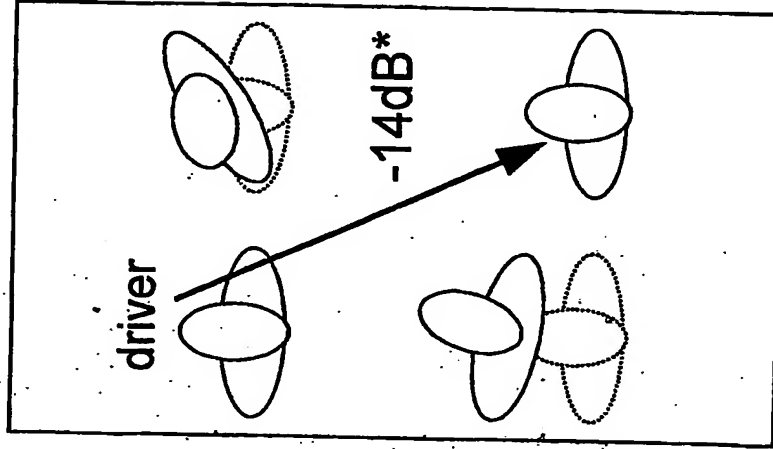
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# In-Car Communication System

TEMIC

Speech Dialog Systems

passenger compartment



\*Acoustic loss  
(referred to co-driver  
ear)

- Communication between passengers is difficult because of acoustic loss (especially front to back)
- Driver turns around – road safety is reduced
- Front passengers have to speak louder than normal – longer conversations will be tiring

## Application

- In mid and high class automobiles which are already equipped with the necessary audio- and signal-processing equipment
- Vans, etc. - systems with reduced quality

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## System Requirements

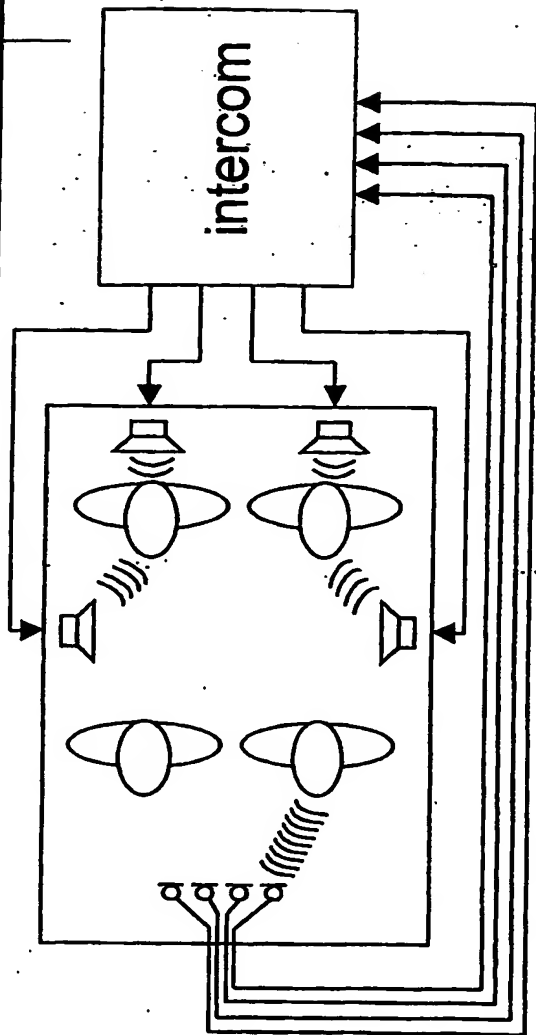
- The speech signal of the driver and the co-driver should be reproduced with high quality and with a minimum system delay by the rear loudspeakers. The speech signal of the passengers in the back should be reproduced by the front speakers
- The passengers should not be aware of the system
- Speaker localization should be preserved by the system
- System stability has to be guaranteed
- The in-car communication system has to be realized on existing hardware (e.g. hands-free-/ speech-dialog-system)

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## Implementation

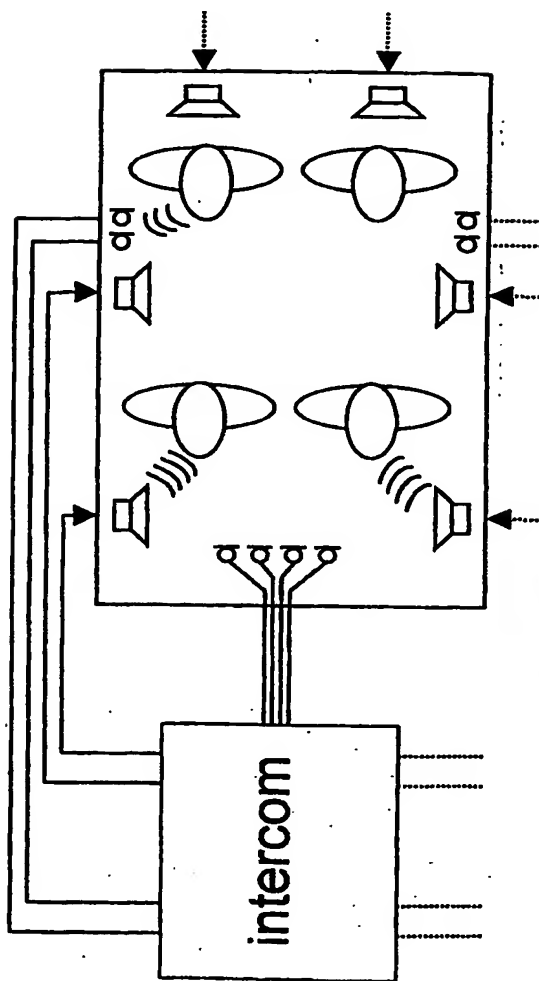
### One-way system

- 2-4 microphones
- 2-4 speakers



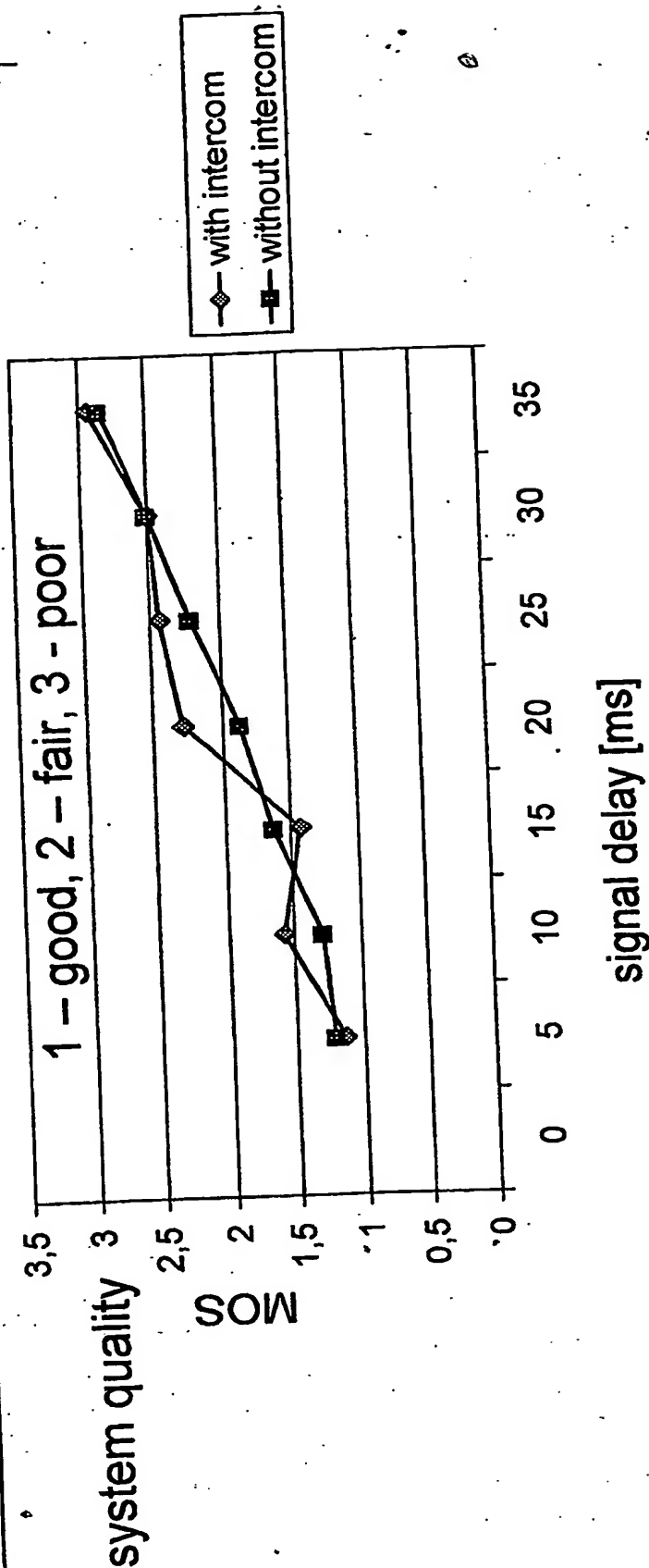
### Two-way system

- 4-8 microphones
- 6-8 speakers



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## Signal Delay and Placement

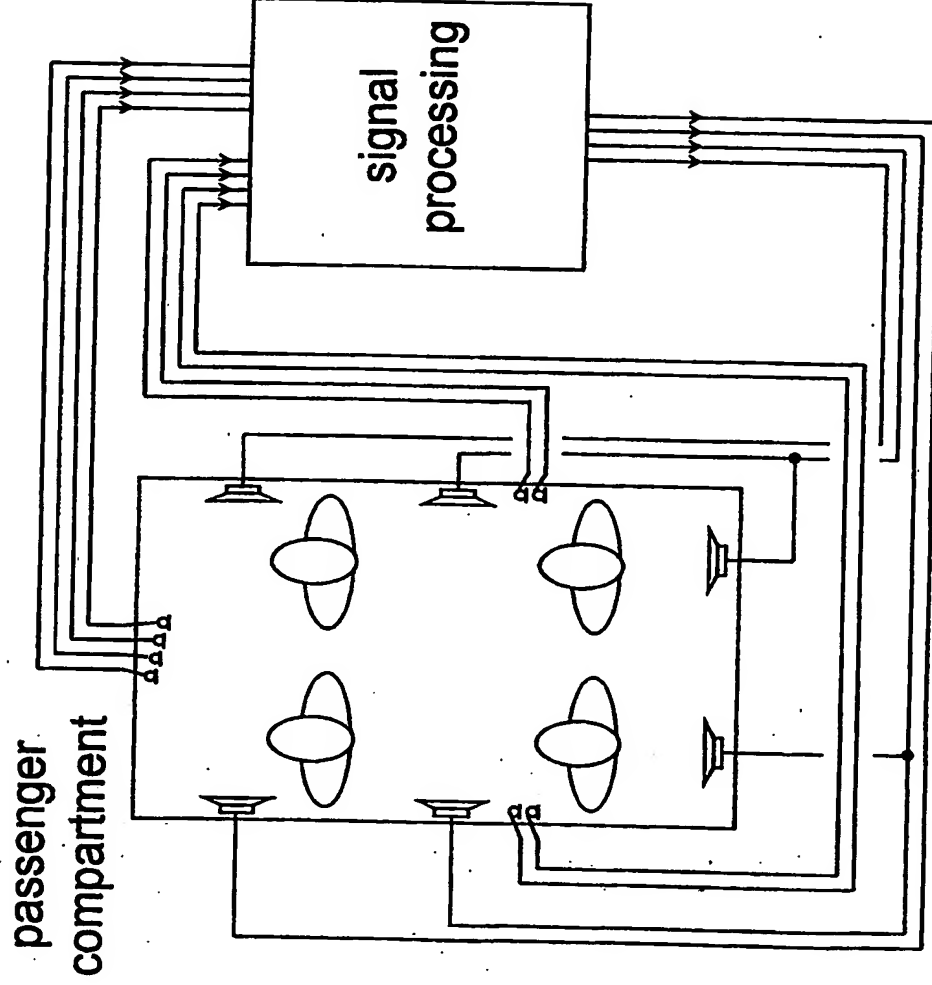


- The overall signal delay should be less than 15 ms
- To minimize the risk of feedback, the microphones and loudspeakers should be placed as close as possible to the passengers

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# System Demonstrator (S-Class Mercedes)

**TEMIC**  
Speech Dialog Systems



## system requirements:

- 100 MHz DSP
- 4 ... 8 ADC
- 4 ... 6 DAC

## system functionality:

- Two-way system with feedback suppression
- System output level is controlled depending on the noise level at the microphones

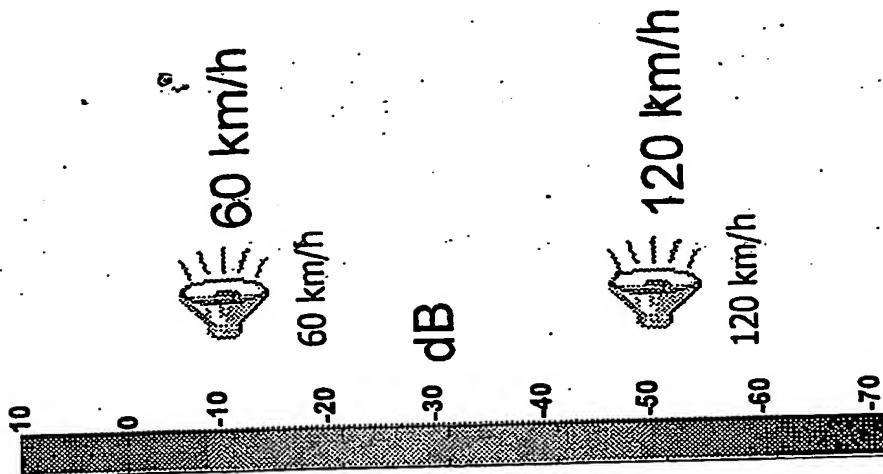
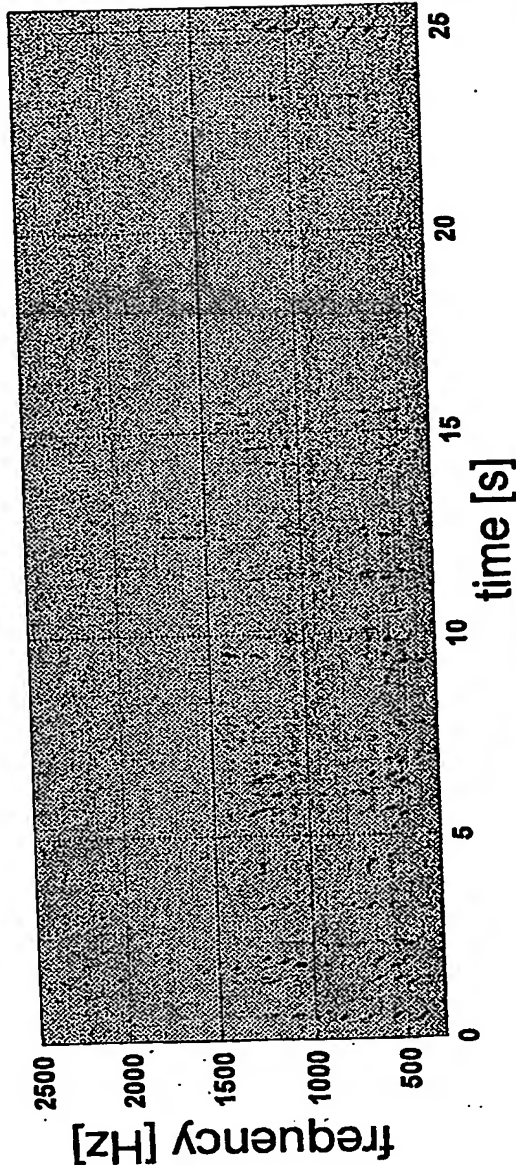
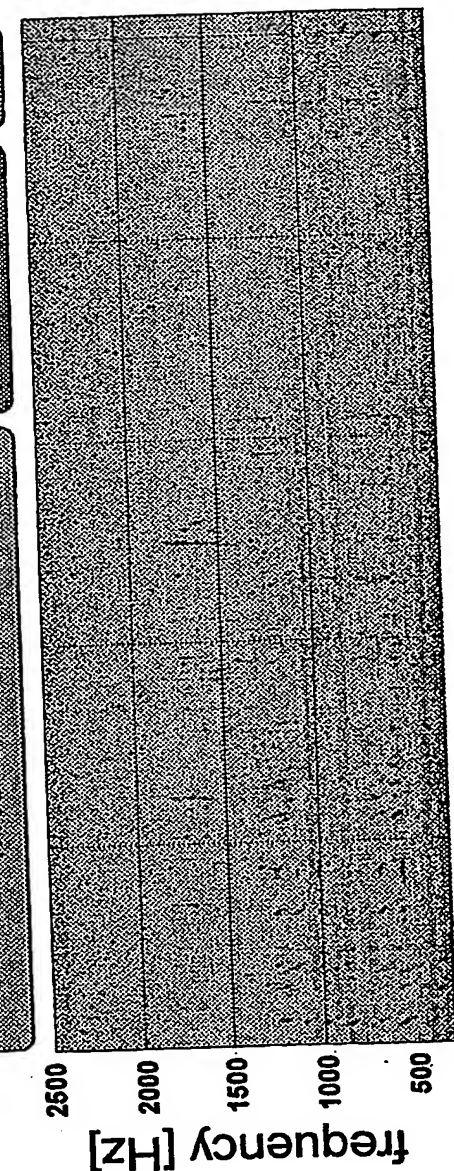
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## Audio-Demonstration (Binaural Recording)

intercom on

off

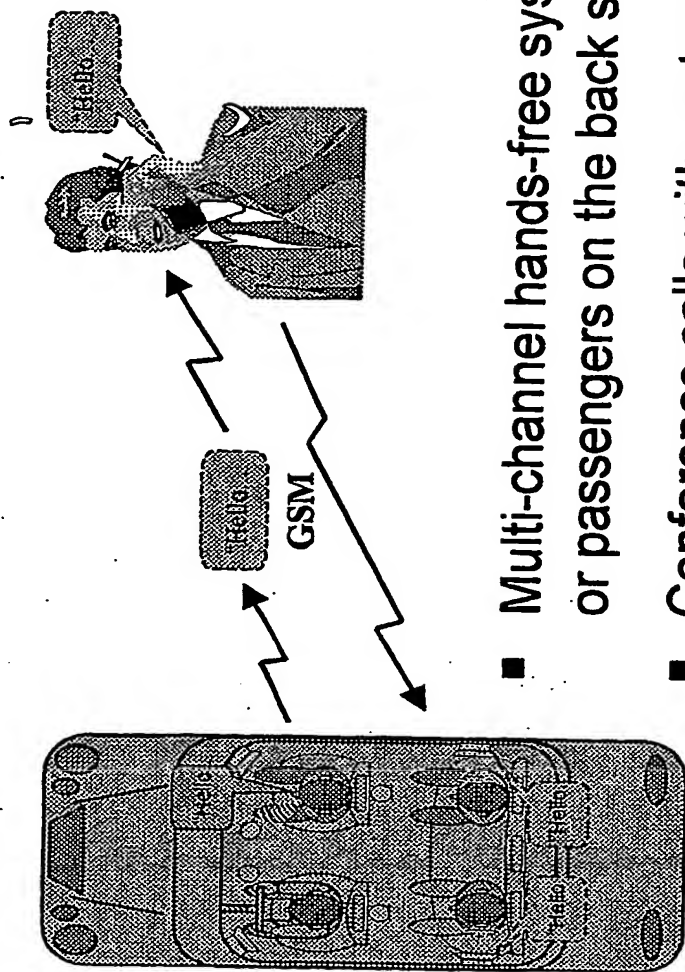
on



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# Conference Calls/ In-Car Communication

**TEMIC**  
Speech Dialog Systems



- Multi-channel hands-free system for driver and co-driver or passengers on the back seats
- Conference calls with up to 4 partners with Intercom functionality from the front to the back
- Intercom functionality between passengers in the front and in the back
- Speech Processing capabilities available for all seats

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